

Abstracts of Technical Articles by Bell System Authors

*Administration of a Sampling Inspection Plan.*¹ H. F. DODGE. Greatly expanded production during the war brought about extensive use of scientific sampling plans both within manufacturing plants and by procurement agencies. Perhaps most widely used were standard plans involving single sampling, double sampling, and multiple sampling for visual and gaging inspections on a go no-go basis. This paper discusses how a manufacturer may make use of these sampling plans in a manufacturing plant, how he goes about deciding on suitable levels of quality expressed in per cent defective, how he determines whether sampling can be used advantageously in place of 100% inspection, and how he can choose and administer sampling plans that will limit the risks of sampling as well as provide the desired protection with a minimum amount of inspection. Particular attention is given to the operating characteristics and the mode of application of the standard AOQL (average outgoing quality limit) sampling plans published by Dodge and Romig.

*The Bridge Erosion of Electrical Contacts. Part I.*² J. J. LANDER and L. H. GERMER. Bridge erosion is the transfer of metal from one electrode to the others, which occurs when an electric current is broken in a low voltage circuit which is essentially purely resistive. It is associated with the bridge of molten metal formed between the electrodes as they are pulled apart, and more specifically with the ultimate boiling of some of the metal of this bridge before the contact is finally broken. This paper is concerned with fundamental studies of this molten bridge and with empirical measurements of the transfer of metal.

*Electron Bombardment Conductivity in Diamond.*³ KENNETH G. MCKAY. A study has been made of electron bombardment conductivity in diamond using primary electrons of energies up to 14,000 ev. An alternating field method is used which reduces or eliminates the effects of internal space charge fields. Data on internal yields as a function of crystal field are given for both electron and positive hole carriers. Internal yields as high as 600 have been attained. The experimental curves are fitted to a theoretical curve for the space charge free crystal from which are derived reasonable values for the number of electrons produced in the conduction band per incident primary electron, the probable life time of the conduction

¹ *Industrial Quality Control*, November 1948.

² *Jour. Applied Physics*, October 1948.

³ *Phys. Rev.*, December 1, 1948.

electrons and the crystal trap density. Experiments are described which lead to a hypothesis of space charge neutralization. A possible cause of the current fluctuations observed at high crystal fields is discussed.

*The Philosophy of PCM.*⁴ B. M. OLIVER, J. R. PIERCE and C. E. SHANNON. Recent papers describe experiments in transmitting speech by PCM (pulse code modulation). This paper shows in a general way some of the advantages of PCM, and distinguishes between what can be achieved with PCM and with other broadband systems, such as large-index FM. The intent is to explain the various points simply, rather than to elaborate them in detail. The paper is for those who want to find out about PCM rather than for those who want to design a system. Many important factors will arise in the design of a system which are not considered in this paper.

*Objectives for Sound Portrayal.*⁵ RALPH K. POTTER. Translation of sound into visible patterns is discussed in terms of broad objectives. It is suggested that no single design can be optimum and that perhaps the most useful standard of reference is the human ear. Special interests and complexity generally affect final design requirements.

*A Waveguide Bridge for Measuring Gain at 4000 Mc.*⁶ A. L. SAMUEL and C. F. CRANDELL. A bridge has been constructed for measuring the gain and phase delay of amplifiers in the vicinity of 4000 Mc. The equipment is described, and the methods employed to reduce the possible errors are discussed. The general method may be adapted for use in any desired frequency range.

*Video Distribution Facilities for Television Transmission.*⁷ ERNEST H. SCHREIBER. This paper describes the Bell System's plans for furnishing network and local video facilities. The Telephone Company is now using broad-band coaxial cable and microwave radio systems to provide regular message telephone service on a number of principal intercity routes throughout the nation. These facilities can be used to provide television transmission channels when properly equipped. Video service between Washington, D. C., New York, and Boston over these two types of facilities has been demonstrated. New facilities are rapidly being extended. Local video channels for pickup and metropolitan-area networks are provided by ordinary paper-insulated cable pairs, special shielded polyethylene-insulated pairs, by microwave radio systems, or by combinations of these systems. Amplifier and equalizing arrangements for providing wide-band transmission over these facilities are described. Present Bell System views of the availability of microwave and coaxial cable facilities on the principal routes,

⁴ *Proc. I. R. E.*, November 1948.

⁵ *Jour. Acous. Soc. Amer.*, January 1949.

⁶ *Proc. I. R. E.—Waves and Electrons Section*—November 1948.

⁷ *S. M. P. E. Journal*, December 1948.

types of circuits, bandwidths, bridging and terminating arrangements, and general information concerning the provision of television circuits are covered.

*Communication in the Presence of Noise.*⁸ CLAUDE E. SHANNON. A method is developed for representing any communication system geometrically. Messages and the corresponding signals are points in two "function spaces," and the modulation process is a mapping of one space into the other. Using this representation, a number of results in communication theory are deduced concerning expansion and compression of bandwidth and the threshold effect. Formulas are found for the maximum rate of transmission of binary digits over a system when the signal is perturbed by various types of noise. Some of the properties of "ideal" systems which transmit at this maximum rate are discussed. The equivalent number of binary digits per second for certain information sources is calculated.

*Earth Conduction Effects in Transmission Systems*⁹ ERLING D. SUNDE. Earth conduction problems are encountered in both communication and power system engineering in connection with investigations of earth resistivity, grounding, corrosion of buried metallic structures, power system impedances and fault currents, inductive interference, lightning disturbances, and in connection with ground-wave radiation fields. Mr. Sunde deals comprehensively with the theory underlying various earth conduction effects and with its engineering applications, and brings together in unified manner many topics that hitherto have received only separate discussion in the literature. The author's purpose throughout has been to tie his discussion to practical considerations and problems.

Beginning with a review of the theory underlying various earth conduction effects and with its engineering applications, the book contains the following chapter headings: basic electromagnetic concepts and equations, earth resistivity testing and analysis, resistance of grounding arrangements, mutual impedance of insulated earth-return conductors, propagation characteristics of earth-return conductors, d-c earth conduction and corrosion protection, power system earth conduction and inductive interference, surge characteristics of earth-return conductors, lightning protection of cable and transmission lines.

A carefully compiled bibliography is included.

⁸ *Proc. I. R. E.*, January 1949.

⁹ Published by *D. VanNostrand Company, Inc.*, New York, London and Toronto, January, 1949. 373 pages. \$6.00.